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**Dates:** Received: 29 July, 2015; Accepted: 13 October, 2015; Published: 15 October, 2015

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[www.peertechz.com](http://www.peertechz.com)

ISSN: 2455-1759

**Keywords:** Quality of life; Total laryngectomy; Esophageal voice; Tracheoesophageal prosthesis; Alaryngeal voice

## Introduction

According to the Brazilian National Institute of Cancer (INCA), cancer of the larynx is the second most common in the world among the various types of head and neck cancers, corresponding to about 25% of the tumors that affect this region and to 2% of all malignant disease. These tumors are more frequent among men older than 40 years. The main risk factors are the intake of ethyl alcohol and smoking which, when combined, potentiate the risk [1].

Partial or total laryngectomy or chemoradiotherapy, each alone or in combination, are possible treatments in cases of cancer of the larynx [2-4]. In total laryngectomy, performed in advanced cases of cancer of the larynx, the patient completely loses his laryngeal voice, with consequent modifications in the form of communication, in quality of life, in personal interactions, as well as in social, physical and emotional aspects [5,6]. Total laryngectomees may also face losses of nasal and olfactory function as well as poor coughing, difficulty in swallowing, changes in pulmonary function, eventual complications

## Review Article

# Scientific Evidence Regarding the Quality of Life of Total Laryngectomees

### Abstract

**Introduction:** The loss of laryngeal voice after total laryngectomy can have an impact on the quality of life and communication of affected individuals. Postoperative phonatory methods may promote advantages in oral communication and reduce the functional, organic and emotional changes experienced by the patients. On this basis, the objective of the present study was to review the literature in order to determine the impact on the quality of life of total laryngectomees according to the form of rehabilitation chosen after the procedure and to identify the protocols most frequently used to assess the quality of life of these individuals.

**Results and Discussion:** The application of quality of life protocols reveals that total laryngectomees face an impact at the social, physical and psychological levels. Regarding the forms of rehabilitation, success can be achieved with any one of the phonatory methods used after total laryngectomy as long as the patients are guided by a speech therapist and monitored by a multidisciplinary team. Users have reported that a tracheoesophageal prosthesis produced a voice most similar to laryngeal voice, with better scores in the physical and socioemotional domains compared to other alaryngeal methods. A wide diversity of questionnaires used to assess quality of life was detected, those most frequently employed being the "Vocal Disadvantage Index" (VDI), "Quality of Life and Voice" (QLV) protocol, "Quality Assessment Questionnaire of Life at the University of Washington" (UW-QOL), "Functional Assessment of Cancer Therapy" (FACT-H&N), "European Organization for Research and Treatment of Cancer" (EORTC QLQ-C30), and "Medical Outcomes Study 36-Item Short-Form Health Survey" (SF-36). Despite such diversity of protocols for assessment, the results demonstrate an increased voice quality (VQ) after alaryngeal rehabilitation.

**Conclusion:** The present review revealed that total laryngectomy has a relevant impact at the physical, emotional and psychological levels on the patients, as shown by most of the questionnaires applied. In general, the results of the present study revealed moderate VQ scores after total laryngectomy. The tracheoesophageal prosthesis yielded a better result in terms of quality of life because of its closer proximity to laryngeal voice compared to esophageal voice.

in the tracheostoma, and lifelong functional and psychological consequences [7]. Phonation is the feature that undergoes the greatest transformation [8].

When total laryngectomy is chosen as a treatment modality there are three possibilities of vocal rehabilitation: esophageal voice (EV), a tracheoesophageal prosthesis (TEP), and an electronic larynx. The methods most frequently used are EV and tracheoesophageal voice [6].

Some authors [9] have observed that the TEP is the form of rehabilitation that most resembles laryngeal voice in terms of fundamental frequency, intensity and maximum phonation time. Other authors [10] have also reported that this mode of alaryngeal rehabilitation has become the gold standard at various voice rehabilitation centers since its introduction in 1980. The new sound source is the pharyngoesophageal segment, which acts on vibration and sound production [11-14].

The advantages of rehabilitation with a TEP are based on good success rates, short learning time, and use of the lungs as a source of air for phonation. This increases the maximum phonatory time of this

process and improves vocal intensity, which is stronger compared to other forms of rehabilitation. Among the disadvantages of TEPs is their high cost, especially in developing countries, [15,10] the need of monitoring by the surgeon for the maintenance and replacement of the prosthesis, and the need to use one hand for occlusion of the tracheostoma [16]. Attention should also be paid to the integrity of the pharyngoesophageal segment, the size of the valve, the solution of leakage problems, and fungal infestation, which continue to be problems despite the advances in the design of the prostheses [10]. The fistula for the placement of the TEP can be made at the time of total laryngectomy (primary) or during a later phase (secondary). Primary placement avoids a second surgical procedure and permits a more rapid and successful voice restoration. However, secondary TEP placement may prevent postoperative complications such as fistulas and sequelae due to radiation. Some authors have reported that secondary placement favors a better performance [17,7], whereas others have stated that primary placement is responsible for better results [18-20].

When esophageal voice is chosen for rehabilitation, a grave, hoarse and monotonous vocal quality is observed, although, after proper training, this voice becomes intelligible to any listener. Factors preventing the acquisition of esophageal voice may be of a physical, cognitive or psychological nature [21].

Among the advantages of esophageal voice, in addition to the hands being free during conversation, is the fact that this is an adaptation of the organism itself, although a varying time of treatment is required for a speaker to become skilled [7]. On average, voice intelligibility increases during the first year after total laryngectomy [22]. However, the cited authors [22] observed a variable rate of success, with more than half the patients at six months and a quarter of all patients at one year after laryngectomy being unable to speak in an intelligible manner.

Considering the positive and limiting aspects of both alternatives, it is relevant to obtain information about their impact on the quality of life of laryngectomized patients so that the clinicians and researchers who aim at not only a cure but also at full patient wellbeing can obtain new knowledge about this process of adaptation to a new form of communication [6]. The questionnaires that assess the quality of voice and of life of patients submitted to cancer treatment and to the rehabilitation process are used to determine the impact of this process on social activity and family life in the physical and emotional domains [23]. A literature review [24] demonstrated the existence of a quantity of instruments used for patients with head and neck cancer for subjective assessment of quality of life. Among them are: the European EORTC Quality of Life questionnaires (EORTC-QLQ C30 and HN35) [25], the Functional Assessment of Cancer Therapy [26] questionnaire, and The University of Washington Quality of Life questionnaire (UW-QOL) [27]. Others are used for a detailed assessment of the discourse, the ability to swallow and the sensation of pain, such as the Voice Handicap Index (VHI) [28]; The Voice-Related Quality of Life questionnaire (VR-QOL) [29] and the MD Anderson Dysphagia Inventory (MDADI) [30].

In this respect, determining in the literature the impact on quality

of life of the communicative alternative developed and of the protocols used to determine quality of life may provide new information for evidence-based clinical practice regarding the rehabilitation of individuals submitted to total laryngectomy.

The objective of the present review was to survey the literature to determine the impact on patient quality of life of the form of rehabilitation chosen after total laryngectomy and to identify the protocols most frequently used to assess the quality of life of these individuals.

## Materials and Methods

This was a literature review of scientific articles published in the SciELO and PubMed databases between 2005 and 2015, regardless of language.

Quality of life was used as the main research term and the articles were selected in an initial investigation by reading the abstracts and/or the full text. The key words used for the search were: “quality of life AND laryngeal cancer”, “quality of life AND prosthetic voice users”, “voice handicap index AND tracheoesophageal voice”, and “voice prosthesis”.

**Inclusion criteria:** The articles included were those that assessed by means of questionnaires the quality of life in its psychological and/or functional, social and emotional aspects of patients with cancer of the larynx submitted to surgical treatment (total laryngectomy) and to chemoradiotherapy, and dealing with a combination of different forms of speech rehabilitation (esophageal voice - EV, tracheoesophageal prosthesis - TEP, or electrolarynx - EL).

Studies that compared total laryngectomy to partial laryngectomy or to organ preservation protocols were also included, with emphasis on the results of quality of life protocols applied to total laryngectomees. Also included were articles dealing with the quality of life in the presence of cancer of the larynx, without specifying the type of surgery.

**Exclusion criteria:** We excluded citations that did not permit access to the full paper and repeated citations by overlapping key words. Sixty-three of the 82 texts surveyed, which were not directly related to the topic, were excluded. Thus, 17 articles that fulfilled the established inclusion criteria were included in this review.

**Data analysis:** The following markers were considered for the analysis of the 7 selected studies: type of study (cross-sectional or cohort study), objective of the study, questionnaires used, and main results.

Data are presented in chronological order based on division according to type of study.

## Results

### Cross-sectional studies

Some authors [2] have investigated the impact of total and partial laryngectomy on quality of life in terms of functional, physical, psychological and social aspects. In the studies surveyed, 14 patients were submitted to total laryngectomy and 16 to partial

vertical laryngectomy. Three patients were rehabilitated with EV associated with gestures, 4 with tracheoesophageal voice, 1 with an electrolarynx, and 6 with other nonverbal forms of communication. Ten patients were submitted to speech therapy. Both groups received radiotherapy. Quality of life was assessed using the QLQ-C30 and H & N35 questionnaires [31] and depression was assessed using the Beck Depression Inventory [32]. Regarding the C30 questionnaire, although the mean score for overall quality of life was the same in both groups (83.3), the total laryngectomy group showed worse separate results due to definitive changes caused by breathing through the tracheostomy, by the impossibility of communicating through the larynx, by fatigue, a dry mouth, and financial difficulties. In the functional domain, the lowest scores were obtained for social function and daily activities. For the emotional item there was no significant difference between groups. Comparison of communication with the 3 forms of rehabilitation of total laryngectomees showed the best mean value for EV (93.3), followed by TEP (86.6) and EL (60). The quality of life of the patients submitted to total laryngectomy did not depend on the type of alaryngeal communication employed and for this reason the authors did not provide these scores for comparison. In response to the H & N35, total laryngectomees reported more complaints than patients submitted to partial laryngectomy. In response to the Beck Depression Inventory, only one patient from the total laryngectomy group obtained a score indicative of depression.

In another study [33], validated protocols for the investigation of quality of life (University of Washington Quality of life scale - UW-QOL, and Functional Assessment of Cancer Therapy Head and Neck scale, FACT-H&N), as well as a questionnaire containing demographic information were applied to 16 total laryngectomees who were TEP users. The results revealed that the individuals were able to communicate with other people and that they judged their postoperative voice to be closely or almost similar to their preoperative voice. Two thirds of the patients considered their speech to be intelligible, with the occasional need for repetition, while the remaining third stated that their speech was always intelligible. All patients stated that they were understood on the telephone and 87% of them stated that they were highly satisfied with their form of communication. On this basis, the authors concluded that the restoration of communication with a TEP satisfied expectations and provided a good quality of life as measured with parameters such as physical, functional, social and emotional wellbeing.

Other authors [19] interviewed 25 patients with total laryngectomy who were users of a TEP by applying a self-administered vocal prosthesis questionnaire elaborated by the authors themselves. The results revealed improved quality of life for 24 users, although women were less satisfied with the quality of alaryngeal voice than men. Twenty patients reported that they were satisfied with their voice restoration. Some of the reasons reported for dissatisfaction with restored voice were grave male voice, unpredictable voice, inability to sing, fatigue, and unrealistic expectations about the vocal valve. Thirteen users reported a low voice tone and only 2 reported a weak voice on the telephone. Fourteen patients (60%) reported a recent leakage around or in the middle of the prosthesis, whose useful life is of three months. The authors considered the questionnaire

to be a valuable instrument for the monitoring of alaryngeal voice rehabilitation.

Another study [34] applied the quality of life and voice (QLV) protocol and a vocal self-perception script [35] to six total laryngectomees, four of them rehabilitated with EV and two with a TEP. All subjects received phonotherapy. The results of the QLV questionnaire revealed a mean value of 63.19 for the physical domain, with better scores for TEP users and a mean value of 80.20 for the scioemotional domain, with maximum scores (100) for TEP users. When compared to esophageal speakers, total laryngectomees using a TEP as a form of communication showed a better index of quality of life, which was also related to a better voice self-perception. The main complaint of esophageal speakers was the difficulty in speaking and being heard in a noisy environment and they described their voice as grave and weak. In contrast, TEP users predominantly perceived their voice as comfortable, pleasant and clear, indicating a better vocal quality.

Other authors [36] assessed the quality of life after total or partial laryngectomy using the Hospital Anxiety and Depression (HAD) [37] scale to evaluate the frequency of occurrence and intensity of fear and depression, and the EORTC QLQ-C30 questionnaire. The study was conducted on 51 individuals submitted to total or partial laryngectomy and to radiotherapy and chemotherapy as adjuvant treatment. The authors did not differentiate the participants regarding the form of surgery and the occurrence of alaryngeal rehabilitation after total laryngectomy. Most participants (96%) assessed their general health status as moderate (71% and 25%, respectively). Regarding the disorders of social functioning, 44% of the patients reported marked limitation of contact with other people, with complaints about not being understood by both unknown and close persons. General problems in communication with others were detected in 92% of the patients. There were complaints of feeling fatigue (61%) and 49% of the subjects reported a strong or moderate loss of appetite. Pain, breathing, nausea and vomiting were rated as moderate or significant by 34% of the group. The HAD scale revealed clinical symptoms of fear in 80% of the patients and symptoms of depression in 86%. The results demonstrated a change in the psychological status of these individuals when facing the disease and the treatment proposed.

Another investigation [38] identified differences in quality of life between patients treated for cancer of the larynx with conservation of the organ and total laryngectomees, although no details were given about the number of participants or the form of rehabilitation after total laryngectomy. All patients (n =111) responded to the quality of life questionnaires EORTC QLQ-C30 and QLQ-H & N35. In the C30 questionnaire, the general score and the score for the cognitive domain were better for patients submitted to conservative treatment compared to surgical treatment for cancer of the larynx. In contrast, the best scores for the functional domain and insomnia problems were observed in the group submitted to surgery. The scores for the physical, emotional and social domains were the same for the two groups. Patients submitted to sequential or simultaneous radio chemotherapy showed greater symptoms of dry mouth and thick saliva than those submitted to complementary radiotherapy after total

laryngectomy, probably owing to accumulated toxicity. There was no difference between treatment groups regarding voice or swallowing disorder. The authors concluded that the type of treatment, surgical or conservative, directly affected various aspects of the quality of life.

Other investigators [39] analyzed the relationship between perceptive-auditory assessment, visual analog scale, and extraction of acoustic and self-assessment measures of 35 men submitted to total laryngectomy who were TEP users. There was a marked change in general voice impression, intonation, pitch, and speech slowness and rate. Self-assessment with the protocol of quality of life and voice, Voice Handicap Index (VHI) showed a mean value of 46.9. The authors concluded that the level of tracheoesophageal speech deviation showed a relationship between vocal quality and temporal aspects of speech.

The objective of another study [4] was to identify the aspects of quality of life of patients with cancer of the larynx after the different forms of treatment. Quality of life was assessed by applying the "University of Washington Quality of Life" - (UW-QOL), questionnaire to 41 individuals treated with combined modalities (surgery and chemotherapy/radiotherapy in 11 patients), primary radiotherapy ( $n = 26$ ), and chemoradiotherapy ( $n = 4$ ). The authors did not specify the surgeries performed or whether the participants had been submitted to any form of alaryngeal rehabilitation. Overall quality of life was 81.1 out of 100 and was significantly higher in patients submitted to primary radiotherapy (90.0/100) than in patients submitted to combined treatment (71.6/100) or chemoradiotherapy (70.8/100). Saliva production was significantly worse in patients submitted to chemoradiotherapy (median: 16.5/100) than in patients submitted to combined treatment (median: 67.0/100). The latter patients reported worse VQ in terms of discourse, shoulder function and lymphedema than patients submitted to chemoradiotherapy, although they reported a better quality of life in terms of taste. However, these associations were not statistically significant.

A study [40] assessed satisfaction with communication and its relationship with quality of life in total laryngectomees submitted to neck dissection and adjuvant radiotherapy using the protocol of Communication Satisfaction Assessment of Patients after Total Laryngectomy [41]. All patients were rehabilitated with esophageal voice. The results revealed that 65.7% of the users gave responses that affected the quality of life. A more negative rating concerned the morph functional aspect (77.3%), followed by the family relations item (69%), while 66.7% of the individuals did not show discomfort or effort. There was a more negative impact on all questions related to singing (80%), changing the tone of voice during speech (86.6%), producing some speech sounds (80%), and talking on the telephone (80%). Regarding the social relations domains, 93.3% of the subjects interviewed stated that most people had difficulty in understanding them.

Some authors [42], assessed the relationship between intelligible speech, speech acceptability and self-reported quality of life after total laryngectomy in 25 subjects, 16 of whom used a TEP, 2 EV and 7 EL as a form of communication. The instruments used were the UW-QOL and VHI-10. VHI scores revealed greater vocal disadvantage for EL users (21.0) compared to TEP (17, 64) and EV (10.50) users.

The results of the UW-QOL questionnaire revealed a better general score for EV (90.0) than for TEP (70.67) and EL (62.86). EV users also showed better scores in the socioemotional, physical and speech domains, i.e., 83, 34, 95, 86 and 100, respectively. The small number of EV users did not cause the above results to be significant. However, a significant difference was detected between TEP and EL in the speech domain, with TEP users showing better voice function. Intelligibility and acceptability results were also better for EV users (96.58 and 45.80, respectively), although significantly better scores were obtained for TEP users in both dimensions (92.39 and 41.90) when compared to EL users (81.74 and 16.30). Speech acceptability was found to be negative for all methods, although speech intelligibility was considered to be good. Comparison of quality of life and speech revealed a moderate general quality of life.

Other authors [43] investigated how the forms of coping and traditional factors such as age, sex, time after laryngectomy, disease stage, radiation, and method of alaryngeal voice can predict overall quality of life and voice quality after total laryngectomy. Sixty-seven total laryngectomees participated, 35 of them being TEP users, 7 EV users, and 20 EL users, while 5 communicated in writing. The WOC-CV [44], QLV and UW-QOL instruments were used. It was observed that quality of life improved with time after surgery. No significant differences were detected among the methods of alaryngeal communication: EL ( $M = 77.28$ ), TEP ( $M = 66.45$ ) and EV ( $M = 72.94$ ). The quality of life was significantly worse for communication in writing ( $M = 40.50$ ). The most frequent stressful problems caused by laryngectomy regardless of the method of vocal rehabilitation were the limitations of physical ability, appearance and life style, followed by uncertainty about the future regarding the cancer. According to the authors, the results suggested that the individuals who used the escape-avoidance coping strategy, particularly regarding behavior and cognition, showed poorer results.

Another study [45] described the impact of swallowing on quality of life in 15 patients submitted to total laryngectomy and rehabilitated with EV. The quality of life related to swallowing was determined by the Swallowing Quality of Life Questionnaire (SWAL-QOL) 46. The general health condition was reported as good by a significant percentage of participants. Regarding the SWAL-QOL domains, swallowing was found to have a severe impact on quality of life after total laryngectomy, since the "communication" and "fear" domains indicated the greatest impairment of quality of life related to swallowing. The "eating duration" had a moderate impact. The items with the highest absolute and relative frequency of a response between 0 and 50 were a longer time needed to eat (53.3%), coughing to remove fluid or food from the mouth when standing up (40% and 46.7%, respectively), difficulty to be understood (46.7%), and fear of asphyxia and pneumonia (40% and 53.3%, respectively).

## Cohort studies

A longitudinal study [3] assessed the quality of life of surgically treated patients with carcinoma of the larynx, hypopharynx or changes in the oropharynx along time. Quality of life was assessed with the EORTC QLQ-C30 and EORTC QLQ-H & N35 questionnaires before and three and six months after treatment. Fifty-three individuals participated in the study, 32 submitted to partial laryngectomy (PL)

and 21 to total laryngectomy (TL). The authors considered TL and PL without specifying the forms of alaryngeal rehabilitation. The results of the functional scales of the QLQ-C30 revealed impairment of physical condition, working disability, emotional decadence and interference with family and social life for three months after surgery, with a gradual recovery within six months in both groups. The TL group had pain since the situation preceding treatment and lasting 3 months and progressively decreasing 6 months after surgery. PL patients had greater dyspnea and fatigue than TL patients during the first six months after surgery. The EORTC-QLQ H & N 35 questionnaire revealed increased olfaction and taste problems in both groups for three months after surgery, with symptoms disappearing by six months in the PL group. There were no changes in swallowing or in feeling ill in the intragroup analysis, although worse swallowing adaptation was observed in the PL group compared to TL patients. Regarding communication, there was a significant difference in both groups before and after 3 and 6 months of rehabilitation. TL subjects had difficulty in attending a social event after 6 months of treatment and both groups had more difficulty in spending time with family and friends by 3 months after surgery, a condition that disappeared by 6 months.

Another investigation [47] assessed the changes in quality of life and the degree of vocal disadvantage in total laryngectomees before and after the placement of a TEP. Twelve male laryngectomees responded to the University of Michigan Head & Neck Quality of Life-HNQOL [48] and to the Vocal Disadvantage Index (VDI) instruments. Regarding the HNQOL questionnaire, the “communication”, “emotional” and “total” domains revealed a better quality of life after placement of the TEP. The “pain” and “eating” domains did not differ significantly before and after TEP placement, although the scores of the pain domain were increased. The participants reported less vocal disadvantage after voice restoration for each VDI subscale. No statistically significant difference was detected for the correlation of time after laryngectomy, which ranged from 1 month to 16 years, with time of questionnaire application after TEP placement.

Other authors [22] described the types of voice used in daily life and investigated the association of voice type with speech intelligibility. Speech intelligibility was assessed six months ( $n = 273$ ) and one year ( $n = 225$ ), after total laryngectomy. Regarding the form of rehabilitation, the patients were asked to report how many times they used each type of voice in their daily life and mentioned the use of EV, TEP and EL. The Post-laryngectomy-Telephone-Intelligibility-Test (PTLT) [49] was used to measure intelligibility, which increased during the first year after total laryngectomy, with the values being particularly high for esophageal speakers. However, more than half the patients at 6 months and more than a quarter of them at 1 year after total laryngectomy were unable to speak in an intelligible manner. Improved speech intelligibility occurred in patients who used EV in their daily life compared to the use of the electronic device. In contrast, TEP users obtained a more rapid success in speech rehabilitation. It would be desirable to always offer more than a single type of voice to the patients after total laryngectomy.

Rossi et al. [6], assessed the quality of life and voice of 30 patients divided into groups according to type of treatment: (G1) ten

patients submitted to total laryngectomy (six with and four without radiotherapy) who communicated in writing or with gestures, (G2) ten patients submitted to total laryngectomy (five with and five without radiotherapy) who used a TEP; and (G3) ten patients exclusively treated with chemoradiotherapy. Quality of life was measured using the SF-36 [50], Voice-Related Quality of Life and Vocal Disadvantage Index protocols. The participant's performed self-assessment of their voices, which were taped and analyzed by a speech therapist. The quality of life of patients with tracheoesophageal voice was close to that of patients exclusively treated with chemoradiotherapy. The results of the SF-36 questionnaire demonstrated that G1 complained of pain more frequently than G2 and G3. The quality of life of TEP users was better than that of G1 but worse than that of the group with a preserved larynx. The VHI questionnaire revealed that G1 showed more vocal disadvantage in all items compared to the remaining groups. In self-assessment, patients exclusively treated with chemoradiotherapy showed results similar to those for patients with a TEP. Assessment by speech therapists showed worse results than self-assessment by the participants.

## Discussion

Cancer of the larynx is prevalent among males with a mean age of more than 60 years [2-4,19,33,36,39,43].

Quality of life has been considered to be an important parameter for the assessment of patients with head and neck cancer, [2-4,6,33,34,36,42,43] explaining the increasing number of studies of VQ along the period of time analyzed in the present literature review.

Papers dealing with the quality of life in the presence of cancer of the larynx and its different forms of treatment are available in the literature, i.e., partial or total laryngectomy of chemoradiotherapy, followed by rehabilitation after total laryngectomy with a TEP, EV or EL. Of the studies surveyed here, most were of the cross-sectional type and four were cohort (longitudinal) studies. We observed a small number of longitudinal studies, with a variety of forms to compare quality of life and total laryngectomy. The forms of comparison were: quality of life between total and partial laryngectomy; quality of life of users with a TEP, and quality of life between different alternatives of rehabilitation. The difficulty in following up treated patients with head and neck cancer is usually one of the factors that impair longitudinal studies, especially on a medium- and long-term basis. This occurs both because of non-adherence to periodic controls of quality of life and because of possible relapses or evolution of the disease. Multicenter studies may help minimize these limitations and obtain larger samples with longitudinal follow-up. To this end, the standardization of questionnaires for quality of life is of fundamental importance.

Regarding the type of rehabilitation after total laryngectomy, success can be achieved with any one of the phonatory methods and it is the task of the speech therapist physician to provide all the information needed for the patient to make the appropriate choice according to his necessities and to skills that will provide a better quality of life [7]. Being aware of the changes that occur after total laryngectomy is also important to permit early intervention measures on the part of the multidisciplinary team.

Other investigators [40], reported that individuals with EV after laryngectomy had great difficulty with verbal interaction with their family and with strangers, while their friends turned away; the telephone became a resource that worsened the communicative situation; the patients were upset when they were not understood, they felt physical discomfort when speaking and being unable to express their ideas. TEP users were satisfied with their acquired voice since they were able to communicate with others. Good speech intelligibility was also observed, even on the telephone, and the patients considered the new form of communication to be similar to laryngeal voice [19,33]. When comparing the time before and after TEP placement, some authors [47] observed improved communication and emotional aspects, with the perceived vocal disadvantage also being reduced after TEP placement. Comparison of the different types of voice rehabilitation after laryngectomy revealed that TEP users obtained better results in the physical and socioemotional domains, as well as in the form of communication compared to EV users. The main complaint of esophageal speakers concerned the difficulty in speaking and being heard in noisy environments [34]. A study [42] disagreed with the above authors, revealing that EV showed higher values for the same domains (socioemotional, physical and communication) as well as for intelligibility and acceptability. It was also observed that EL users had a greater vocal disadvantage compared to the other forms of rehabilitation. In another investigation [43], the authors detected no significant differences between the various methods of alaryngeal communication. Studies comparing data obtained with the same protocols for the assessment of quality of voice and quality of life should be conducted in order to obtain scientific evidence when comparing esophageal speakers, tracheoesophageal speakers and users of an electrolarynx.

Regarding the more relevant literature data about the protocols of quality of life applied to total laryngectomees, it can be seen that measuring the impact of the procedure on the social, physical and psychological aspects of the life of these individuals is essential in order to establish parameters of rehabilitation and support for patients and for a better direction of the multidisciplinary team [6].

Another study [36] revealed that total laryngectomees frequently complain about perceiving negative attitudes of others towards themselves possibly due to the unfavorable aesthetic appearance of laryngectomized patients or to the lack of information on the part of the population about how to behave when contacting individuals submitted to this type of treatment. These attitudes increase dissatisfaction with social contacts and life activities and cause a worsening of quality of life in individuals submitted to these treatments. Some investigators [2], also emphasized that aesthetic impairment such as the presence of a definitive tracheostomy may be a cause of changes in the social aspects. These considerations support the need for campaigns for population awareness so that better knowledge might permit a lower social impact.

Some studies have pointed out that emotional status can influence and modify the physical symptoms and social functioning of these individuals. An increased level of fear results in fatigue and in difficulties in social life functioning. The clinical symptoms of depression can result in increased respiratory disorders, nausea and

vomiting, and in the loss of appetite [36]. When facing the disease and the treatment proposed, the patients may undergo a change in psychological status and show lack of acceptance during the postoperative period, a fact that may cause problems related to the rehabilitation method and to the changes in the family dynamics and in the patient himself [36].

The most frequent stressful problems due to laryngectomy, regardless of the method of rehabilitation, were the limitations of physical ability, appearance and life style, followed by uncertainty about the future due to the cancer.

The physical deterioration and pain during the immediate postoperative period (2-3 months) hamper the reintroduction of these individuals into their social life [43]. The restrictions after total laryngectomy continue to be among the great problems for patient rehabilitation, which requires adaptations for the maintenance of some physical activities [34]. In another study [3], functional scales revealed impairment of physical condition after total laryngectomy, as well as inability to work, emotional decadence and interference with family and social life for a period of three months after surgery, with a gradual recovery within six months. Some investigators [2] also observed that daily life activities are altered after total laryngectomy.

Based on the present review, we may state that the rehabilitation methods used after total laryngectomy provide an improved quality of life. However, since the voice acquired does not have the same characteristics as laryngeal voice, it does not provide full satisfaction for the users, who have difficulty in accepting their new physical appearance, the changes in their daily activities, in their job and mainly in the way they communicate. The EV, even though having advantages such as a lower cost and no need to occlude the tracheostoma during speech, has a limited vocal intensity. The TEP has disadvantages such as the need to use one hand to occlude the tracheostoma during speech, which also leads to changes in daily and professional activities, in addition of being of high cost and having a short useful life. On the other hand, it is considered to be the closest to laryngeal voice in terms of vocal quality (frequency, intensity, speech intelligibility and maximum phonation time) even though it has a grave frequency, and its acquisition is more rapid. For this reason, success with the forms of rehabilitation will depend on the real necessities of each individual.

There is a wide diversity of questionnaires used to determine quality of life. Some of them were translated into the language in which they were applied. Among the quality of life protocols applied in the present literature review are: the "Vocal Disadvantage Index" (VDI), [28] validated for the Portuguese [51]; the "Quality of Life and Voice" (QLV) [29], validated for the Portuguese [52]; the Quality Assessment Questionnaire of Life at the University of Washington" (UW-QOL)" [27], validated for the Portuguese [53]; "Functional Assessment of Cancer Therapy" (FACT-H&N) [26], validated for the Portuguese [54], "European Organization for Research and Treatment of Cancer" (EORTC QLQ-C30) [25] reproduced for the Portuguese [55], and the "Medical Outcomes Study 36-Item Short-Form Health Survey" (SF-36) [50] translated into Portuguese [56].

Despite the diversity of the protocols for assessment, the results

demonstrated an increase in VQ after alaryngeal rehabilitation [6,22,47], possibly due to coping mechanisms or adaptation to the new situation [43].

Postoperative time varied widely in the literature. Some studies indicated that this variable did not interfere with the quality of life of laryngectomized individuals [4,36,47], while others demonstrated that a longer postoperative time improved the quality of life [43].

These investigators [43], also demonstrated that older individuals had better scores. The method of communication is also significantly related to VQ. Although women represented smaller samples, they showed more dissatisfaction with alaryngeal VQ than men, probably owing to the grave frequency obtained with the TEP [19]. The gradual increase in the number of women diagnosed with head and neck cancer in this population as a function of a greater consumption of alcoholic drinks and smoking over the last decades will be the subject of future investigations of the aspects that differentiate male and female total laryngectomees.

Another aspect to be considered is swallowing which, after total laryngectomy, showed gradual improvement thanks to the surgical elimination of the tumor and to therapy for alaryngeal rehabilitation [3]. Particularly outstanding aspects of swallowing function were: a longer time to eat, coughing in order to remove fluid or food, and fear of asphyxia and pneumonia [45]. The swallowing of total laryngectomees has been increasingly investigated over the last few years, with the results demonstrating that approximately 40 to 64% of this population have varying degrees of dysphagia [45,57]. Further research dealing in depth with this topic by relating the presence of dysphagia and its causes to quality of life should provide new knowledge in this area.

Patients submitted to combined radiotherapy and surgical treatment reported worse VQ in terms of discourse, shoulder function and lymphedema than those submitted to chemoradiotherapy only, but a better quality of life regarding gustatory function [4]. Patients submitted to sequential or simultaneous radiochemotherapy had more dry mouth and thick saliva symptoms than those submitted to complementary radiotherapy after total laryngectomy, probably owing to accumulated toxicity [4,38]. Quality of life is a broad, subjective and personal concept that deserves constant in-depth investigation. Assessing quality of life is a difficult task since it is a concept that changes according to the priorities of each patient. The present review revealed a variety of validated quality of life questionnaires whose objective is to help determine the sequelae of oncologic treatment that are found to modify the social, emotional and professional aspects, their possible causes and the forms of coping used by total laryngectomees, thus permitting the professionals to choose the therapeutic proposals most appropriate for the necessities of each individual.

Further investigations contemplating a larger number of longitudinal studies and literature reviews would be important in order to demonstrate the quality of life of total laryngectomees on a short-, medium- and long-term basis when comparing different forms of rehabilitation.

## Conclusion

The present review demonstrated that there is a relevant impact on the quality of life of total laryngectomees in the physical, emotional and psychological domains of most of the questionnaires applied. In general, the present results revealed moderate VQ scores after total laryngectomy, in agreement with most of the selected studies.

The largest number of publications involved individuals rehabilitated with a TEP, who showed better quality of life compared to other rehabilitation methods. Therapeutic success is reached when the real necessities and expectations of each individual are contemplated. The TEP proved to be more efficient in solving difficulties in the physical, emotional and psychological domains and provided a more acceptable voice quality.

The quality of life protocols most frequently used were: Vocal Disadvantage Index -VDI; Quality Assessment Questionnaire of Life at the University of Washington (UW-QOL); European Organization for Research and Treatment of Cancer (EORTC QLQ-C30 and H&N 35), and Quality of Life and Voice (QLV).

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**Citation:** Nemr K, Raquel ACS, Takeshita-Monaretti TK, Pires-Buzanelli E, Simões-Zenari M, et al. (2015) Scientific Evidence Regarding the Quality of Life of Total Laryngectomees. *Arch Otolaryngol Rhinol* 1(2): 037-044. DOI: 10.17352/2455-1759.000007